US009144699B1

(12) **United States Patent**
Wang

(10) **Patent No.: US 9,144,699 B1**
(45) **Date of Patent: Sep. 29, 2015**

(54) **GAS INLET STRUCTURE FOR A FIRE EXTINGUISHER**

(71) Applicant: **Chih-Chen Wang**, Tainan (TW)

(72) Inventor: **Chih-Chen Wang**, Tainan (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/292,871**

(22) Filed: **May 31, 2014**

(51) **Int. Cl.**

A62C 35/58	(2006.01)
A62C 13/70	(2006.01)
A62C 13/00	(2006.01)
A62C 13/66	(2006.01)
B05B 11/06	(2006.01)
B05B 7/14	(2006.01)

(52) **U.S. Cl.**
CPC ***A62C 13/70*** (2013.01); ***A62C 13/003*** (2013.01); ***A62C 13/006*** (2013.01); ***A62C 13/66*** (2013.01); ***B05B 7/1404*** (2013.01); ***B05B 11/06*** (2013.01); ***B05B 11/062*** (2013.01)

(58) **Field of Classification Search**
CPC A62C 13/66; A62C 13/006; A62C 13/70; A62C 13/003; B05B 7/1404; B05B 11/06; B05B 11/062; B67D 1/0412
USPC 169/30, 72, 77, 85, 88; 239/650, 654; 222/399
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,620,038	A *	12/1952	Somers et al.	169/77
2,680,546	A *	6/1954	Seaberg	169/85
3,149,677	A *	9/1964	Blair	169/85
3,255,824	A *	6/1966	Rodgers	169/77
7,318,484	B2 *	1/2008	Rousseau et al.	169/85

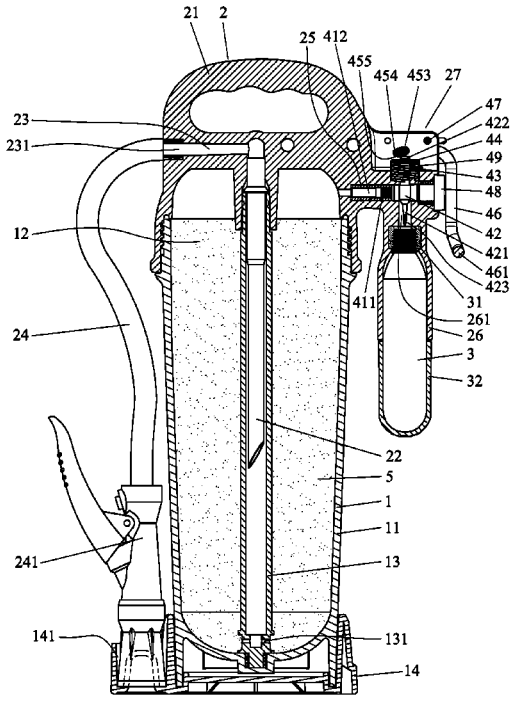
* cited by examiner

Primary Examiner — Steven J Ganey

(57) **ABSTRACT**

A fire extinguisher includes a body including a chamber receiving fire extinguishing powders. An upper cover includes a gas inlet passage and a gas intake in communication with the gas inlet passage. The upper cover further includes a through-hole aligned with the gas intake. A high-pressure steel bottle is coupled to the upper cover. The spring, when not compressed, holds the piercing needle in the gas intake and the through-hole such that the piercing needle will not pierce into a preserved opening of the high-pressure steel bottle. A pressing rod is pivotably connected to the upper cover. A switch handle is operably connected to the pressing rod. If a pin restraining movement of the switch handle is removed, when switch handle is operated to drive the pressing rod to pivot, the piercing needle is actuated by the pressing rod to pierce into the preserved opening of the high-pressure steel bottle.

10 Claims, 7 Drawing Sheets



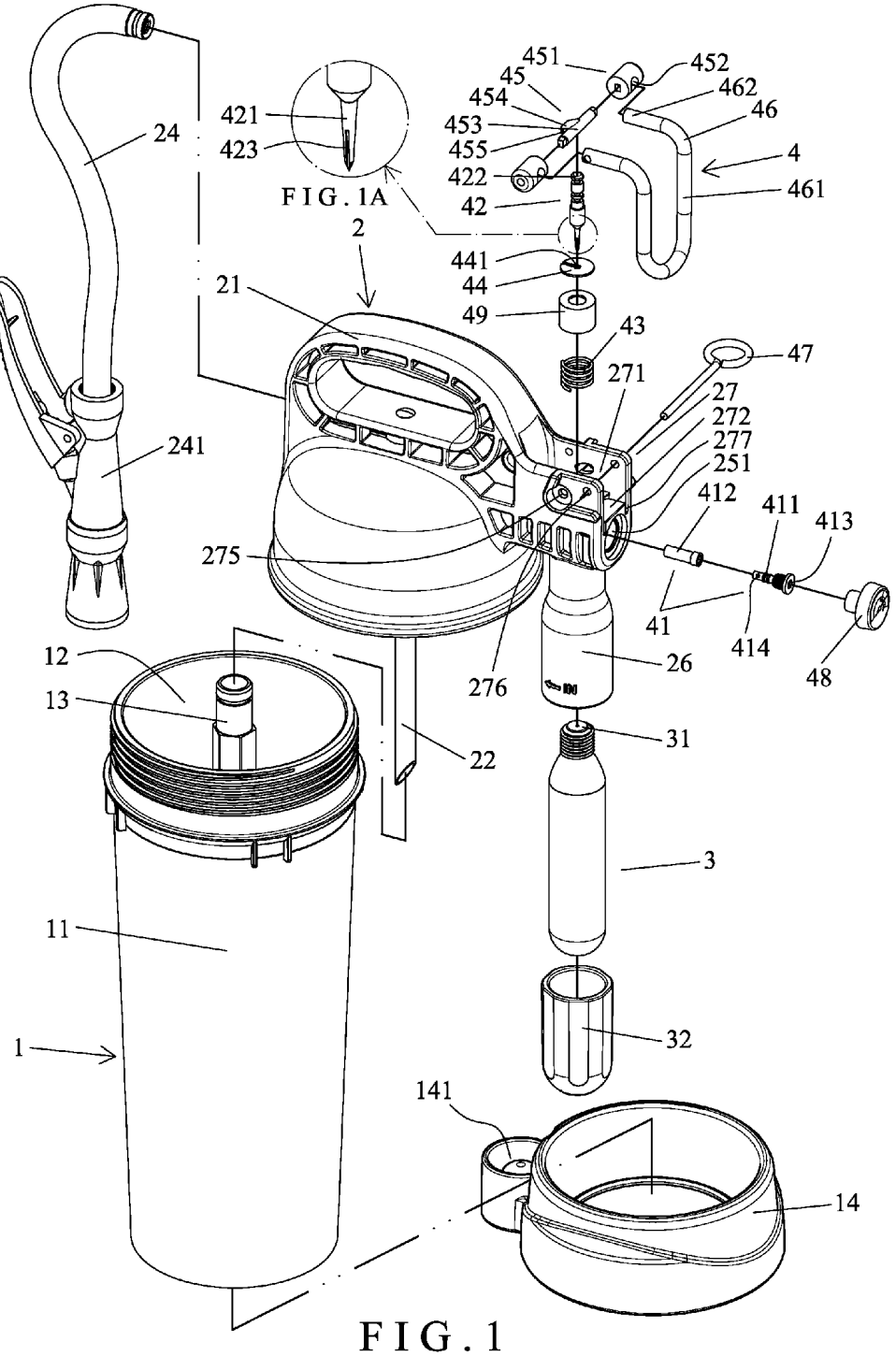

451
45
454
453
455
422
42
452
462
46
4
461
421
423
FIG. 1A
2
441
44
49
43
47
271
27
272
277
251
412
411
413
21
24
241
275
276
41
414
48
26
12
13
22
31
3
11
1
32
141
14

FIG. 1

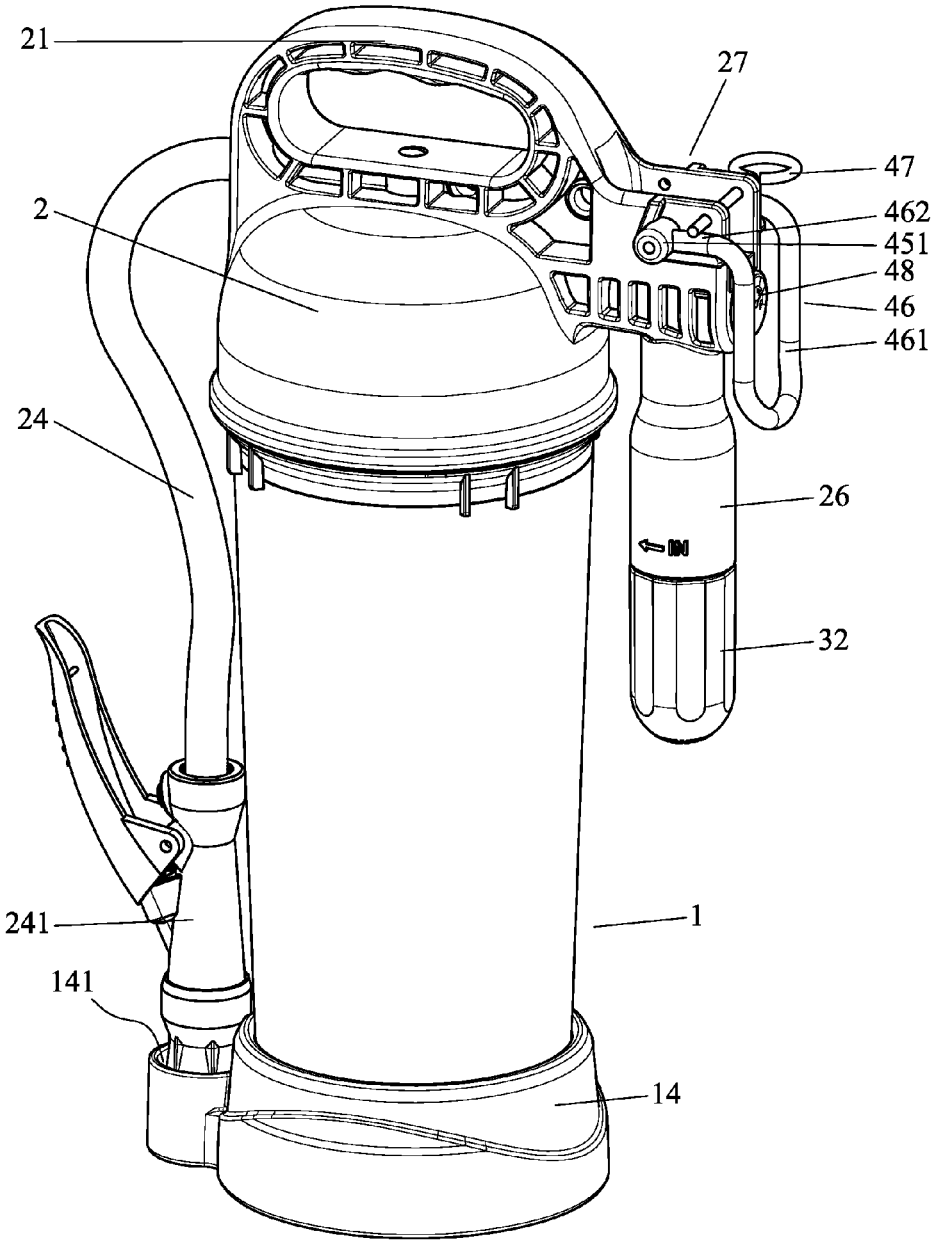


FIG. 2

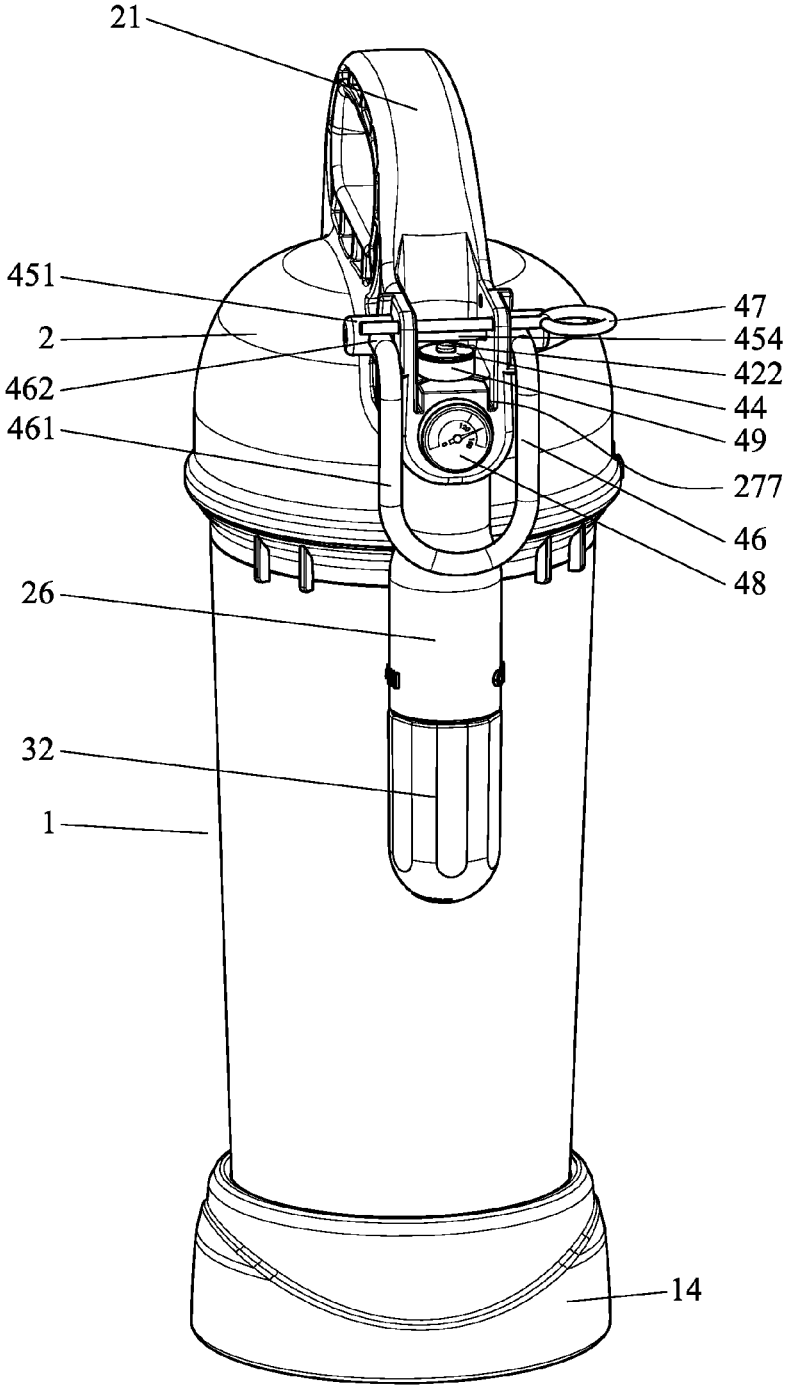


FIG. 3

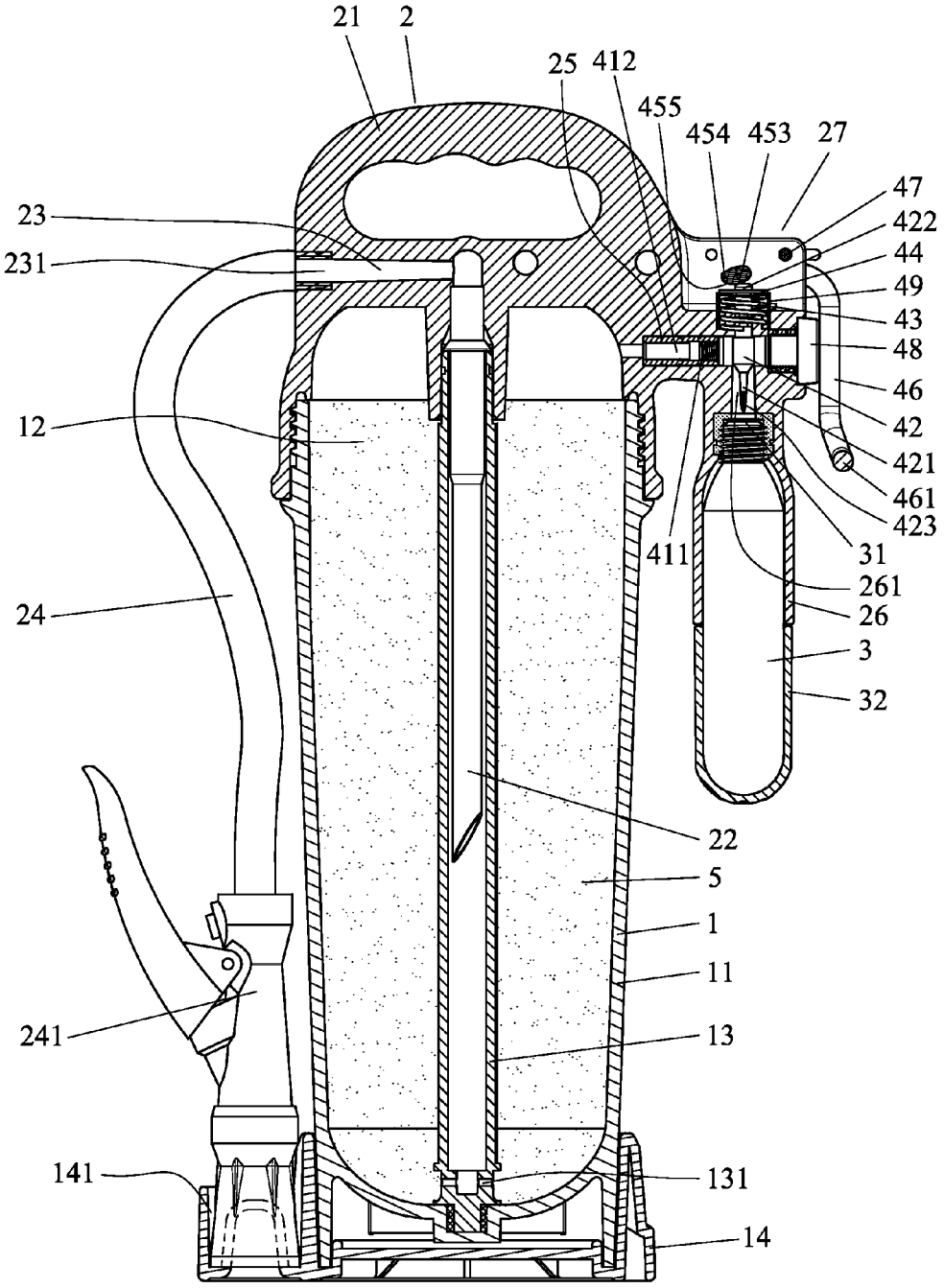

21
2
25
412
455
454
453
27
47
422
44
49
43
48
46
42
421
461
423
31
261
26
3
32
411
23
231
12
24
22
5
1
11
13
241
141
131
14

FIG. 4

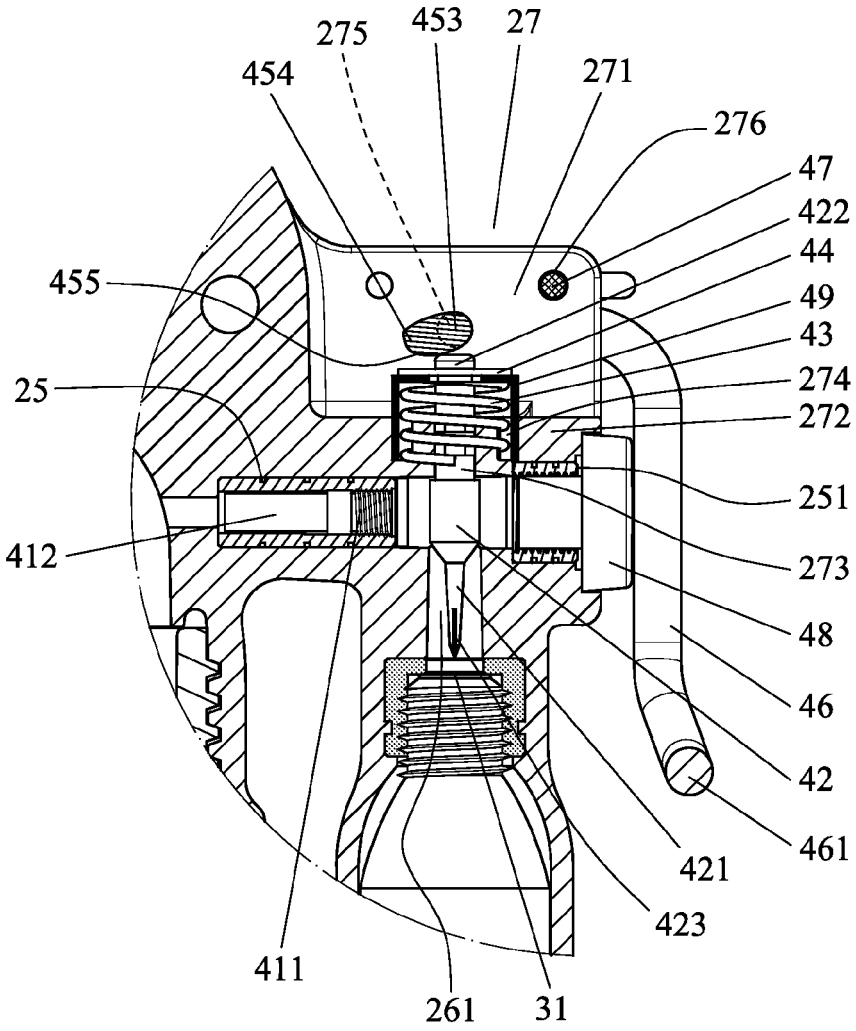

275
453
27
454
271
276
47
422
44
455
49
43
25
274
272
251
412
273
48
46
42
461
421
423
411
261
31

FIG. 5

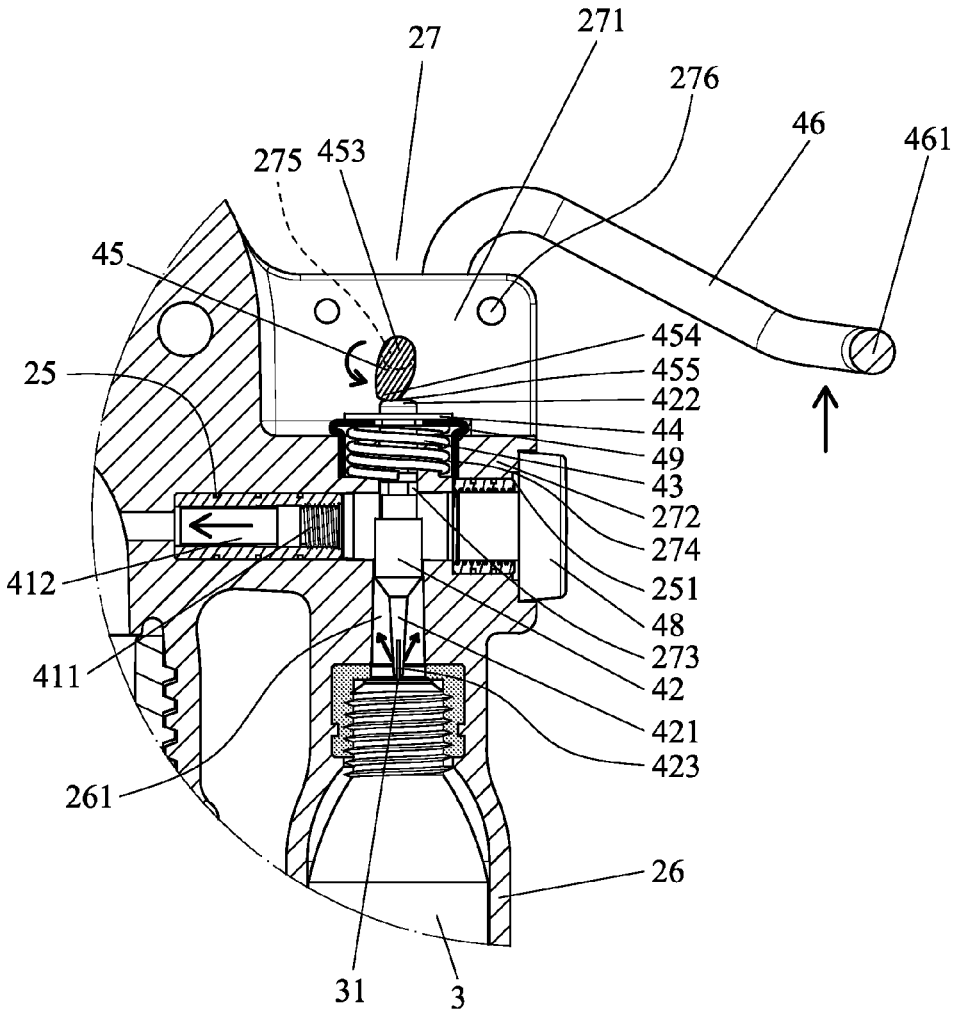

27
271
276
46
461
275
453
45
25
454
455
422
44
49
43
272
274
251
48
273
42
421
423
412
411
261
26
31
3

FIG. 6

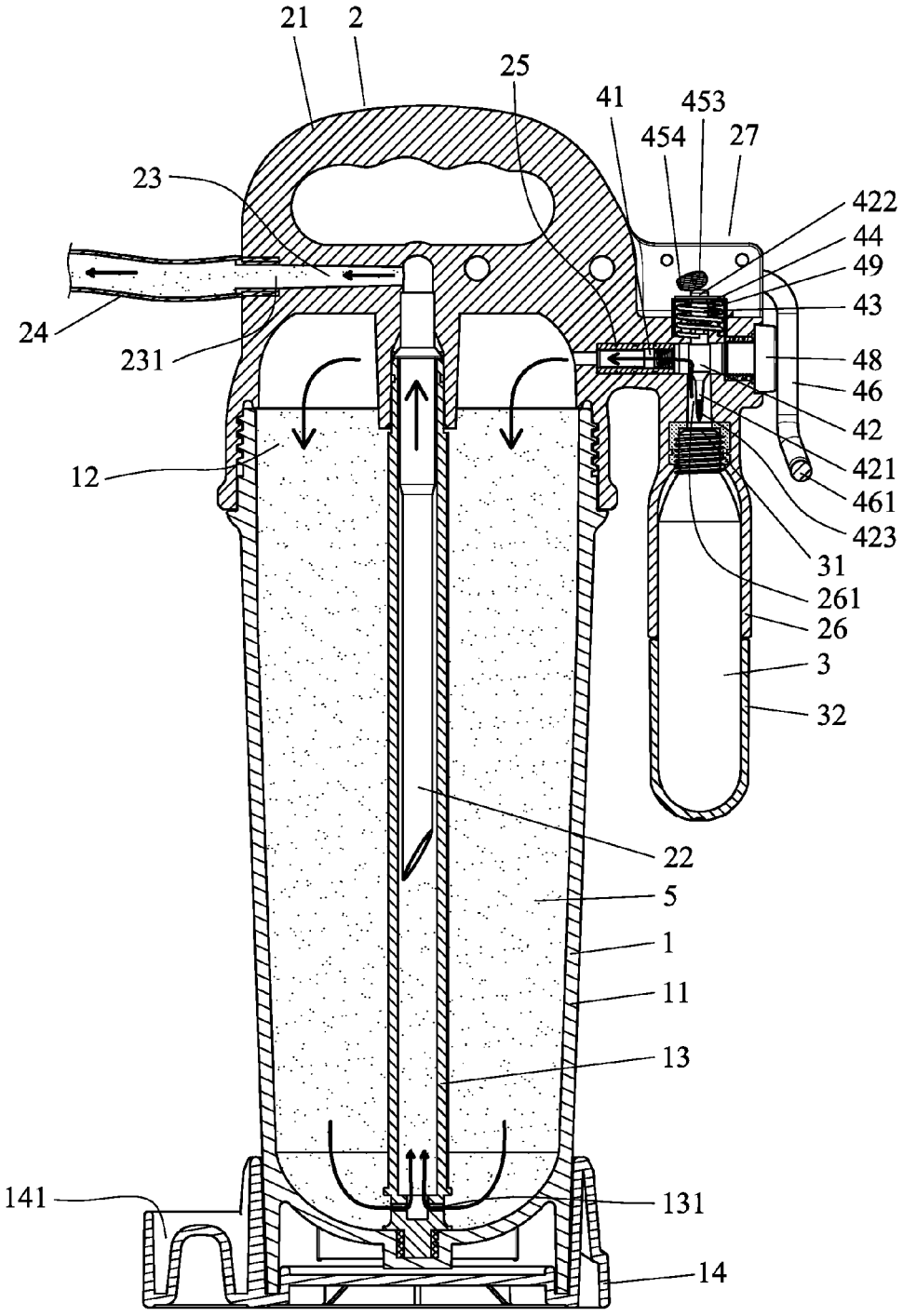

21
2
25
41
453
454
27
23
422
44
49
43
24
231
48
46
42
421
12
461
423
31
261
26
3
32
22
5
1
11
13
141
131
14

FIG. 7

GAS INLET STRUCTURE FOR A FIRE EXTINGUISHER

BACKGROUND OF THE INVENTION

The present invention relates to a gas inlet structure for a fire extinguisher and, more particularly, to a gas inlet structure for a fire extinguisher providing improved safety and reliable force-saving operation.

A type of fire extinguisher includes a pressurized steel bottle receiving fire extinguishing powders. In use, a valve can be pressed to output the fire extinguishing powders together with a high-pressure gas to extinguish the fire. However, the pressure inside the steel bottle decreases over time. When the pressure is insufficient, gas must be filled into the steel bottle, leading to inconvenience in maintenance and filling.

To solve the above disadvantages, a high-pressure steel bottle external to the fire extinguisher is provided. The fire extinguisher includes a body receiving fire extinguisher powders. The body includes an outlet and a gas inlet. The high-pressure steel bottle is connected to the gas inlet. A piercing needle and a button are provided to the body in a location corresponding to the high-pressure steel bottle. A protective cover is provided on top of the button and shields the button to prevent inadvertent pressing of the button. In use, the protective cover is opened, and the button is pressed to actuate the piercing needle to pierce into a preserved opening in the high-pressure steel bottle. The gas contained in the high-pressure bottle is guided into the body and carries the fire extinguisher powders out of the body via the outlet to extinguish fire.

However, a force must be applied to actuate the piercing needle to pierce the high-pressure steel bottle, leading to inconvenience to operation as well as unsuccessful operation if the force is too small. Furthermore, the protective cover could be inadvertently opened by a person other than an intended user, leading to exposure of the button and subsequent pressing in error.

BRIEF SUMMARY OF THE INVENTION

An objective of the present invention is to provide a fire extinguisher providing improved safety and reliable force-saving operation.

A fire extinguisher according to the present invention includes a body including a chamber having an opening in an upper end of the body. The chamber is adapted to receive fire extinguishing powders. An upper cover covers the opening of the body and includes an output passage in communication with the chamber. The upper cover further includes a gas inlet passage in communication with the chamber. The upper cover further includes a first coupling portion having a gas intake in communication with the gas inlet passage. The upper cover further includes a second coupling portion including a through-hole aligned with the gas intake. The second coupling portion further includes at least one pivot hole and at least one pin hole. A high-pressure steel bottle includes a top end coupled to the first coupling portion. The high-pressure steel bottle is adapted to receive a high pressure gas. The high-pressure steel bottle includes a preserved opening aligned with the gas intake.

A gas intake control unit includes a check valve mounted in the gas inlet passage of the upper cover. The check valve is adapted to prevent the gas from flowing through the gas inlet passage in a reverse direction. A piercing needle is mounted in the gas intake of the first coupling portion and the through-hole of the second coupling portion. The piercing needle includes a needle on a bottom end thereof. The needle is adapted to pierce into the preserved opening of the high-pressure steel bottle. The piercing needle further includes an abutment portion on a top end thereof. The abutment portion extends upward beyond the through-hole of the second coupling portion. A spring holds the piercing needle such that the needle of the piercing needle will not pierce into the preserved opening of the high-pressure steel bottle when the spring is not compressed. A pressing rod includes a shank pivotably connected to the at least one pivotal hole of the second coupling portion. The shank includes a pressing portion for pressing against the abutment portion of the piercing needle. A switch handle includes a holding portion located outside of the upper cover. The switch handle further includes at least one side portion operably connected to the pressing rod, with the holding portion spaced from the shank of the pressing rod. A pin extends through the at least one pin hole to restrain movement of the switch handle. If the pin is removed, when the holding portion of switch handle is operated to drive the pressing rod to pivot, the piercing needle is actuated by the pressing portion to pierce into the preserved opening of the high-pressure steel bottle.

In an embodiment, the first coupling portion is located below the gas inlet passage in a vertical direction perpendicular to the horizontal direction. The second coupling portion is located above the gas intake of the first coupling portion in the vertical direction. The second coupling portion includes two sidewalls parallel to each other and a bottom wall extending between the sidewalls. The through-hole of the second coupling portion is located in the bottom wall. The at least one pivotal hole includes two pivotal holes respectively located in the sidewalls. The at least one pin hole includes two pin holes respectively located in the sidewalls. Each pivotal hole is located between one of the pin holes and the body.

In the embodiment, the pressing portion of the pressing rod includes an arcuate side on an outer edge thereof, and the needle of the piercing needle includes a recessed gas passage in a side thereof.

In the embodiment, the gas intake control unit further includes a stop. The spring includes a bottom end abutting the bottom wall of the second coupling portion. The spring further includes a top end abutting the stop. The stop includes a through-hole through which the piercing needle extends. The through-hole of the stop has a diameter smaller than a width of the abutment portion of the piercing needle. The spring abuts the stop and the piercing needle, preventing the needle from piercing into the preserved opening of the high-pressure steel bottle when the spring is not compressed.

In the embodiment, the pressing rod further includes two end seats respectively mounted to outer sides of the sidewalls of the second coupling portion and aligned with the pivotal holes of the sidewalls of the second coupling portion. Each end seat includes a coupling groove. The shank includes two ends respectively extending through the pivotal holes of the sidewalls of the second coupling portion and respectively coupled to the end seats. The at least one side portion of the switch handle includes two side portions respectively coupled to the coupling grooves of the end seats. The side portions of the switch handle are normally located below the pin holes. The pin is located above the switch handle.

In the embodiment shown, the gas inlet passage includes an opening. The gas intake control unit further includes a pressure gauge mounted in and sealing the opening of the gas inlet passage.

In the embodiment shown, the body further includes a guiding tube mounted in a central portion of the chamber. The

guiding tube includes a lower end having an inlet. The upper cover includes an inner tube in a lower end thereof. The inner tube is in communication with the guiding tube. The output passage of the upper cover is in communication with the inner tube and the chamber. The output passage includes an outlet. An output tube has an end connected to the outlet. A valve is mounted in the output tube.

In the embodiment shown, the upper cover further includes a handle on an upper end thereof.

In the embodiment shown, the second coupling portion further includes a drain in front of the bottom wall.

In the embodiment shown, the spring is surrounded by an annular dustproof sleeve made of soft material and located between the stop and the bottom wall of the second coupling portion.

The present invention will become clearer in light of the following detailed description of illustrative embodiments of this invention described in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded, perspective view of a fire extinguisher according to the present invention.

FIG. **2** is a perspective view of the fire extinguisher according to the present invention.

FIG. **3** is another perspective view of the fire extinguisher according to the present invention.

FIG. **4** is a cross sectional side view of the fire extinguisher according to the present invention.

FIG. **5** is an enlarged view of a portion of the fire extinguisher according to the present invention, with a switch handle not pulled.

FIG. **6** is a view similar to FIG. **5**, with the switch handle pulled.

FIG. **7** is a cross sectional view of the fire extinguisher according to the present invention, with the switch handle pulled to output fire extinguishing powders.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIGS. **1-5**, a fire extinguisher according to the present invention includes a body **1**, an upper cover **2**, a high-pressure steel bottle **3**, and a gas intake control unit **4**. The body **1** includes a chamber **11** for receiving fire extinguishing powders **5**. The chamber **11** includes an opening **12** in an upper end of the body **1**. A guiding tube **13** is mounted in a central portion of the chamber **11** and has an inlet **131** in a lower end thereof. A base **14** is mounted to a lower end of the body **1** and includes a holding groove **141**.

The upper cover **2** covers the opening **12** of the body **1** and includes a handle **21** on an upper end thereof. Furthermore, the upper cover **2** includes an output passage **23** in communication with the chamber **11**. The output passage **23** includes an outlet **231**. An end of an output tube **24** is connected to the outlet **231**, and a valve **241** is mounted in the output tube **24**. When not in use, the other end of the output tube **24** is received in the holding groove **141**.

The upper cover **2** further includes a gas inlet passage **25** extending in a horizontal direction of the body **1** and in communication with the chamber **11**. The upper cover **2** further includes a first coupling portion **26** located below the gas inlet passage **25** in a vertical direction perpendicular to the horizontal direction. The first coupling portion **26** has a gas intake **261** in communication with the gas inlet passage **25**. The gas inlet passage **25** includes an opening **251**. The upper cover **2** further includes a second coupling portion **27** located above the gas intake **261** of the first coupling portion **26** in the vertical direction. In the embodiment shown, the second coupling portion **27** includes two sidewalls **271** parallel to each other and a bottom wall **272** extending between the parallel sidewalls **271**. The bottom wall **272** of the second coupling portion **27** includes a through-hole **273** aligned with the gas intake **261**. An annular groove **274** is provided around the through-hole **273**. A pivotal hole **275** and a pin hole **276** are defined in each sidewall **271**. Each pivotal hole **275** is located between one of the pin holes **276** and the body **1**. The second coupling portion **27** further includes a drain **277** in front of the bottom wall **272**. Water accumulated in the second coupling portion **27** can be drained via the drain **277**.

The high-pressure steel bottle **3** includes a top end coupled to the first coupling portion **26**. The high-pressure steel bottle **3** includes a preserved opening **31** aligned with the gas intake **261**. A steel bottle cover **32** is provided below the high pressure steel bottle **3**. The high-pressure steel bottle **3** is adapted to receive a high-pressure gas.

In the embodiment shown, the gas intake control unit **4** includes a check valve **41**, a piercing needle **42**, a spring **43**, a stop **44**, a pressing rod **45**, a switch handle **46**, a pin **47**, a pressure gauge **48**, and a dustproof sleeve **49**. The check valve **41** is mounted in an inner side of the gas inlet passage **25** of the upper cover **2**. The check valve **41** is adapted to prevent the gas from flowing through the gas inlet passage **25** in a reverse direction. The check valve **41** includes a rigid main body **411** and a soft sleeve **412** mounted around the main body **411**. The main body **411** includes a gas inlet **413** in an axial direction. A gas outlet **414** is defined in a side of a rear end of the main body **411**. The high pressure gas can be guided into the main body **411** via the gas inlet **413** and exits the main body **411** via the gas outlet **414** to expand the soft sleeve **412**. Flow of the gas from the gas outlet **414** to the gas inlet **413** is prevented by the soft sleeve **412** covering the gas outlet **414**.

The piercing needle **42** is mounted in the gas intake **261** of the first coupling portion **26** and the through-hole **273** of the second coupling portion **27**. The piercing needle **42** includes a needle **421** on a bottom end thereof. The needle **421** is adapted to pierce into the preserved opening **31** of the high-pressure steel bottle **3**. The piercing needle **42** further includes an abutment portion **422** on a top end thereof. The abutment portion **422** extends upward beyond the through-hole **273** of the second coupling portion **27**. The needle **421** of the piercing needle **42** includes a recessed gas passage **423** in a side thereof.

The spring **43** includes a bottom end located in the annular groove **274** of the bottom wall **272** of the second coupling portion **27**. The spring **43** further includes a top end abutting the stop **44**. The stop **44** includes a through-hole **441** in a center thereof. The piercing needle **42** extends through the through-hole **441**. The through-hole **441** of the stop **44** has a diameter smaller than a width of the abutment portion **422** of the piercing needle **42**. The spring **43** abuts the stop **44** and the piercing needle **42**, preventing the needle **421** from piercing into the preserved opening **31** of the high-pressure steel bottle **3** when the spring **43** is not compressed.

The pressing rod **45** includes two end seats **451** respectively mounted to outer sides of the sidewalls **271** of the second coupling portion **27** and aligned with the pivotal holes **275** of the sidewalls **271**. Each end seat **45** includes a coupling groove **452**. A shank **453** is mounted between the end seats **45** and includes two ends respectively extending through the pivotal holes **275** of the sidewalls **271** of the second coupling portion **27** and respectively coupled to the end seats **47**. Thus, the pressing rod **45** is pivotably mounted to the second coupling portion **27**. The shank **453** includes a pressing portion **454** for pressing against the abutment portion **422** of the

piercing needle **42**. The pressing portion **454** of the shank **453** includes an arcuate side **455** on an outer edge thereof for actuating the piercing needle **42**.

The switch handle **46** includes a holding portion **461** located outside of the upper cover **2**. The switch handle **46** further includes two side portions **462** respectively coupled to the coupling grooves **452** of the end seats **45** of the pressing rod **45**. Thus, the switch handle **46** is operably connected to the end seats **452** of the pressing rod **45**, with the holding portion **461** spaced from the shank **453** of the pressing rod **45**. The side portions **462** of the switch handle **46** are normally located below the pin holes **276**. The pin **47** extends through the pin holes **276** and is located above the side portions **62** of switch handle **46** to restrain movement of the switch handle **46**.

The pressure gauge **48** is mounted in and seals the opening **251** of the gas inlet passage **25**. The dustproof sleeve **49** is made of soft material. The dustproof sleeve **49** is annular and located between the stop **44** and the bottom wall **272** of the second coupling portion **27**. The spring **43** is surrounded by the dustproof sleeve **49** to prevent dust from adhering to the spring **43**, assuring smooth operation even after a long period of time.

When the switch handle **46** is not pulled, the spring **43** holds the piercing needle **42** such that needle **421** of the piercing needle **42** will not pierce into the preserved opening **31** of the high-pressure steel bottle **3**. When the pin **47** is not removed, even if the switch handle **46** is pulled, the side portions **462** of the switch handle **46** press against the pin **47** to avoid pulling of the switch handle **46**, reliably preventing the piercing needle **42** from moving downward to pierce into the preserved opening **31** of the high-pressure steel bottle **3**. In this case, the pressure reading of the pressure gauge **48** is zero.

With reference to FIG. **3**, when a user removes the pin **47** and pulls the switch handle **46** to drive the pressing rod **45** to pivot, the pressing portion **454** presses against the abutment portion **422** of the piercing needle **42** and, thus, moves the piercing needle **42** downward, such that the needle **421** of the piercing needle **42** pierces into the preserved opening **31** of the high-pressure steel bottle **3**. The high-pressure gas is guided out of the high-pressure steel bottle **3** via the recessed gas passage **423**. The above operation can simply be achieved by applying a small force to the holding portion **461** distant to the piercing needle **42** to complete actuation of the piercing needle **42** by the pressing rod **45**. A force-saving lever effect is provided while assuring that an ordinary user can pierce the high-pressure steel bottle **3**. When the switch handle **46** is released, the spring **43** returns the piercing needle **42** to its original position.

With reference to FIGS. **6** and **7**, the high pressure gas in the high-pressure steel bottle **3** passes through the check valve **41** in the gas inlet passage **25** and enters the chamber **11** of the body **1**. The recessed gas passage **423** assures that the high pressure gas can enter the gas inlet passage **25** no matter the piercing needle **42** returns to a position shown in FIG. **7**, providing reliable use. The pressure in the body **1** can be observed from the pressure gauge **48**. Furthermore, the high pressure gas carries the fire extinguishing powders **5** in the body **1** through the guiding tube **13**, the inner tube **22**, and the output tube **24** for extinguishing the fire. The handle **21** is located on the upper end of the upper cover **2** and corresponds to the location of the center of gravity, allowing the user to easily hold the handle **21** while putting out the fire. Thus, the fire extinguisher according to the present invention possesses safety and provides a force-saving effect.

After use, the upper cover **2** can be detached from the body **1** for refilling the fire extinguishing powders **5**. Another high-pressure steel bottle **3** can be attached to the first coupling portion **26**, allowing repeated use of the fire extinguisher. An ordinary user can easily accomplish the detachment without special tools, providing convenient repeated use. It can be appreciated that other types of check valves can be used.

Although specific embodiments have been illustrated and described, numerous modifications and variations are still possible without departing from the scope of the invention. The scope of the invention is limited by the accompanying claims.

The invention claimed is:

1. A fire extinguisher comprising:

a body including a chamber having an opening in an upper end of the body, with the chamber adapted to receive fire extinguishing powders;

an upper cover covering the opening of the body, with the upper cover including an output passage in communication with the chamber, with the upper cover further including a gas inlet passage in communication with the chamber, with the upper cover further including a first coupling portion having a gas intake in communication with the gas inlet passage, with the upper cover further including a second coupling portion, with the second coupling portion including a through-hole aligned with the gas intake, with the second coupling portion further including at least one pivot hole and at least one pin hole;

a high-pressure steel bottle including a top end coupled to the first coupling portion, with the high-pressure steel bottle adapted to receive a high pressure gas, and with the high-pressure steel bottle including a preserved opening aligned with the gas intake; and

a gas intake control unit including:

a check valve mounted in the gas inlet passage of the upper cover, with the check valve adapted to prevent the gas from flowing through the gas inlet passage in a reverse direction;

a piercing needle mounted in the gas intake of the first coupling portion and the through-hole of the second coupling portion, with the piercing needle including a needle on a bottom end thereof, with the needle adapted to pierce into the preserved opening of the high-pressure steel bottle, with the piercing needle further including an abutment portion on a top end thereof, and with the abutment portion extending upward beyond the through-hole of the second coupling portion;

a spring holding the piercing needle such that the needle of the piercing needle will not pierce into the preserved opening of the high-pressure steel bottle when the spring is not compressed;

a pressing rod including a shank pivotably connected to the at least one pivotal hole of the second coupling portion, with the shank including a pressing portion for pressing against the abutment portion of the piercing needle;

a switch handle including a holding portion located outside of the upper cover, with the switch handle further including at least one side portion operably connected to the pressing rod, with the holding portion spaced from the shank of the pressing rod;

a pin extending through the at least one pin hole, with the pin restraining movement of the switch handle, wherein if the pin is removed, when the holding portion of switch handle is operated to drive the pressing rod to pivot, the piercing needle is actuated by the

pressing portion to pierce into the preserved opening of the high-pressure steel bottle.

2. The fire extinguisher as claimed in claim **1**, with the gas inlet passage of the upper cover extending in a horizontal direction of the body, with the first coupling portion located below the gas inlet passage in a vertical direction perpendicular to the horizontal direction, with the second coupling portion located above the gas intake of the first coupling portion in the vertical direction, with the second coupling portion including two sidewalls parallel to each other and a bottom wall extending between the two sidewalls, with the through-hole of the second coupling portion located in the bottom wall, with the at least one pivotal hole including two pivotal holes respectively located in the two sidewalls, with the at least one pin hole including two pin holes respectively located in the two sidewalls, and with each of the two pivotal holes located between one of the two pin holes and the body.

3. The fire extinguisher as claimed in claim **2**, with the pressing portion of the pressing rod including an arcuate side on an outer edge thereof, and with the needle of the piercing needle including a recessed gas passage in a side thereof.

4. The fire extinguisher as claimed in claim **2**, with the gas intake control unit further including a stop, with the spring including a bottom end abutting the bottom wall of the second coupling portion, with the spring further including a top end abutting the stop, with the stop including a through-hole through which the piercing needle extends, with the through-hole of the stop having a diameter smaller than a width of the abutment portion of the piercing needle, with the spring abutting the stop and the piercing needle, preventing the needle from piercing into the preserved opening of the high-pressure steel bottle when the spring is not compressed.

5. The fire extinguisher as claimed in claim **4**, further comprising: a dustproof sleeve made of soft material, with the dustproof sleeve being annular and located between the stop and the bottom wall of the second coupling portion, and with the spring surrounded by the dustproof sleeve.

6. The fire extinguisher as claimed in claim **2**, with the pressing rod further including two end seats respectively mounted to outer sides of the two sidewalls of the second coupling portion and aligned with the two pivotal holes of the two sidewalls of the second coupling portion, with each of the two end seats including a coupling groove, with the shank including two ends respectively extending through the two pivotal holes of the two sidewalls of the second coupling portion and respectively coupled to the two end seats, with the at least one side portion of the switch handle including two side portions respectively coupled to the coupling grooves of the two end seats, with the two side portions of the switch handle normally located below the two pin holes, and with the pin located above the switch handle.

7. The fire extinguisher as claimed in claim **6**, with the gas inlet passage including an opening, and with the gas intake control unit further including a pressure gauge mounted in and sealing the opening of the gas inlet passage.

8. The fire extinguisher as claimed in claim **6**, with the body further including a guiding tube mounted in a central portion of the chamber, with the guiding tube including a lower end having an inlet, with the upper cover including an inner tube in a lower end thereof, with the inner tube in communication with the guiding tube, with the output passage of the upper cover in communication with the inner tube and the chamber, with the output passage including an outlet, with an output tube having an end connected to the outlet, and with a valve mounted in the output tube.

9. The fire extinguisher as claimed in claim **2**, with the upper cover further including a handle on an upper end thereof.

10. The fire extinguisher as claimed in claim **2**, with the second coupling portion further including a drain in front of the bottom wall.

* * * * *